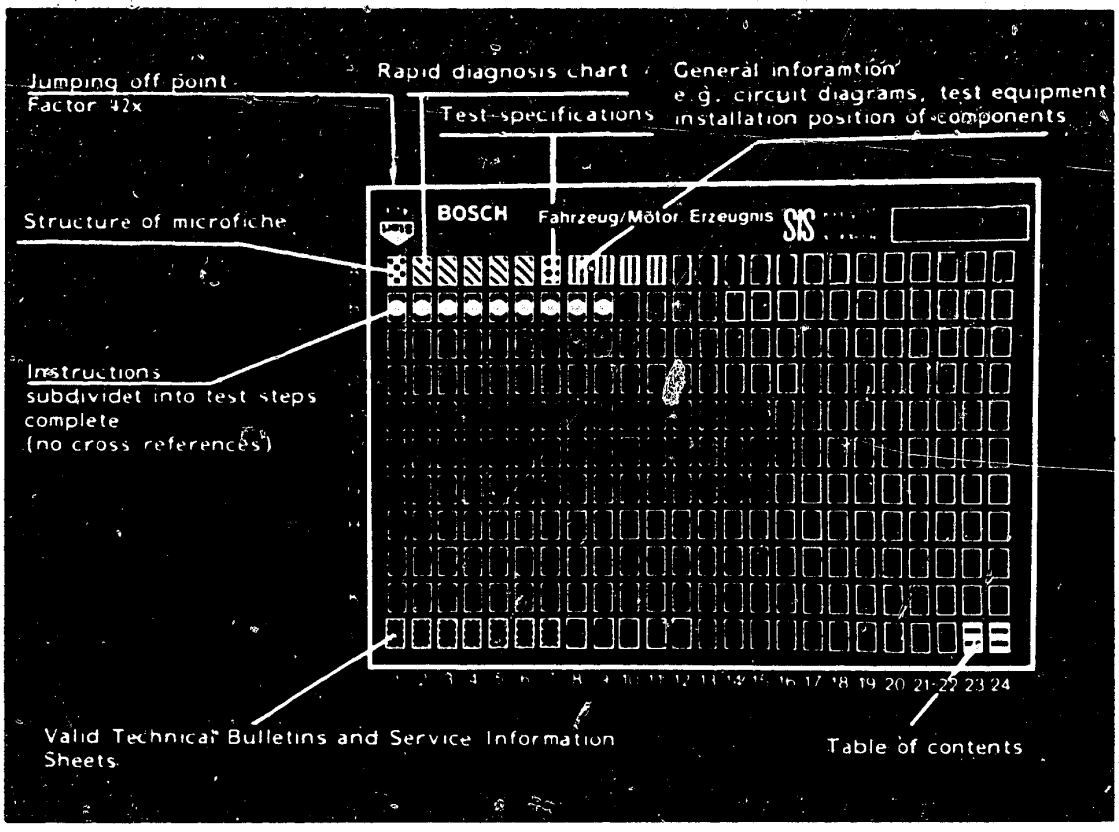
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

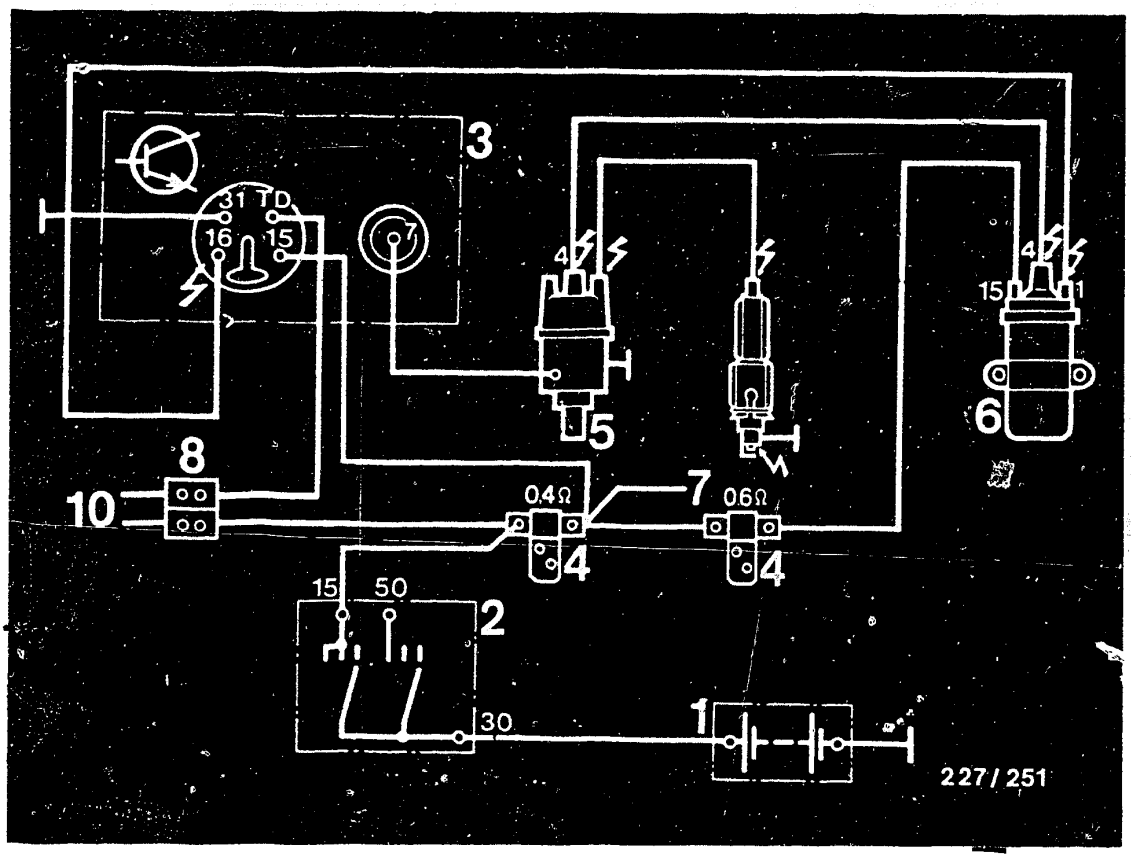
4. References to relevant test steps in test specifications; coordinate e.g. C6

C6

1. Test specifications

Ignition coil, primary	0.3...0.6 Ω	B3
Ignition coil, secondary	7.3...14.5 Ω	
Balast resistor 0.4 Ω	0.3...0.5 Ω	
Balast resistor 0.6 Ω	0.5...0.7 Ω	
Voltage drop	≥ 2.7 V	B5
Ignition coil with ignition on	at $U_B \geq 11$ V	
Voltage drop across breaker points	max. 0.3 V	B7

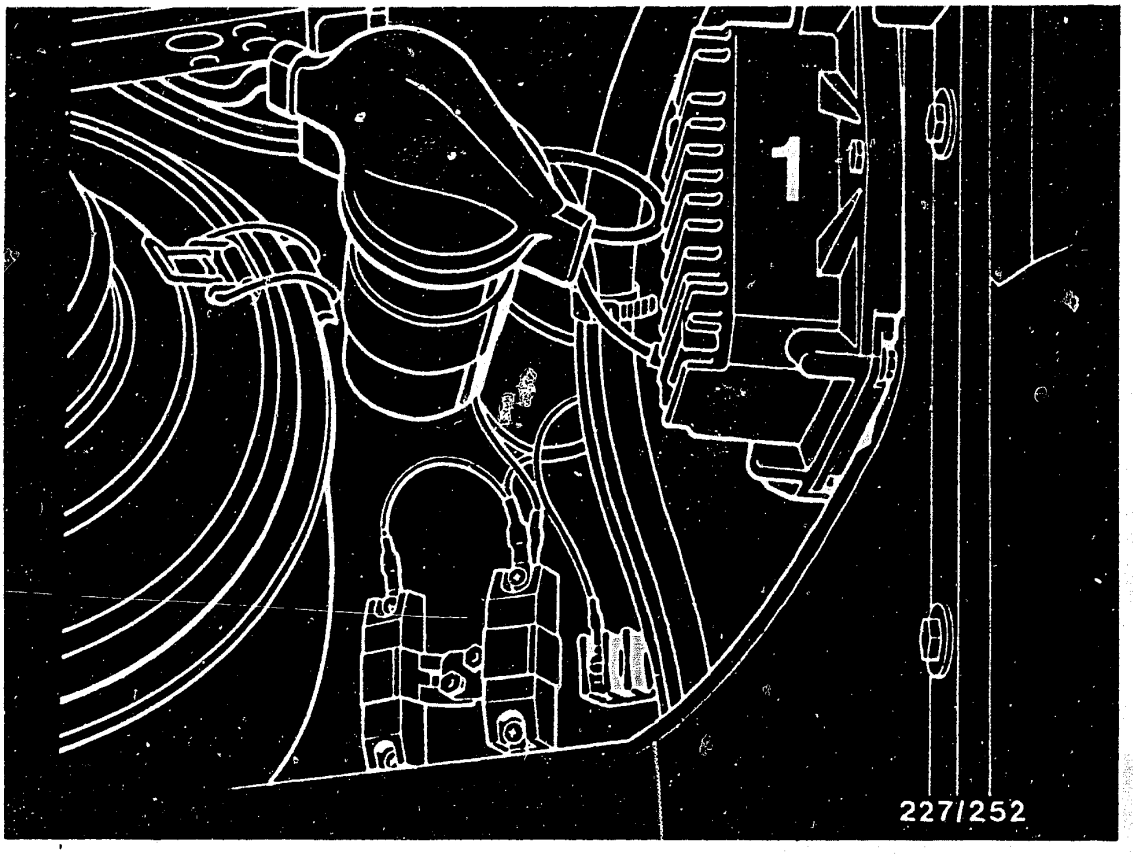
See Autodata test specifications for settings for ignition, idle speed, exhaust gas, valve clearance etc.



1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Balast resistors
5 = Ignition distributor
6 = Ignition coil
7 = To starting motor term. 15a
8 = Cable connector
10 = To diagnostic socket

= Dangerous voltages (400 V - 25 kV)

2. Electrical terminal diagram



1 = Trigger box

3. Installation position of components

The trigger box is mounted in the engine compartment.

5. Necessary test equipment, aids

Motortester e.g.	MOT 2 01	0 684 000 201
Spark gap e.g. Ignition coil and condenser tester	EFAW 106 A	0 681 100 001
or		
Single spark gap	EF 1177/7	1 684 531 000
5 kΩ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e.g.	Pontavi Wh2	Commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Test prods		commercially available

5. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts or terminals are touched (both on the primary as well as the secondary sides).

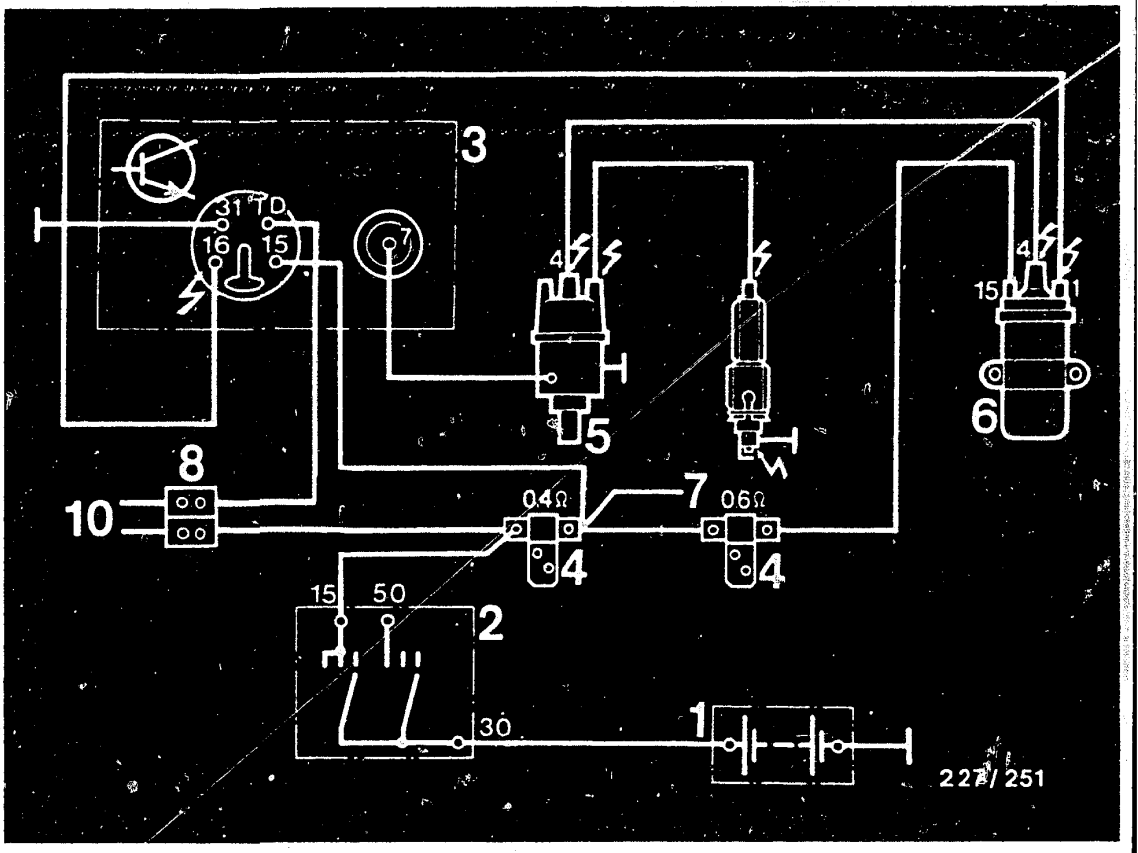
In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope, etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, H.T. ignition cable, etc.).

If, while testing the ignition system or during adjustment work on the engine (e. g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.



1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Series resistors
5 = Ignition distributor
6 = Ignition coil
7 = To starting motor Term. 15a
10 = To diagnostic socket

⚡ = Dangerous voltages (400 V - 25 kV)

Electrical terminal diagram

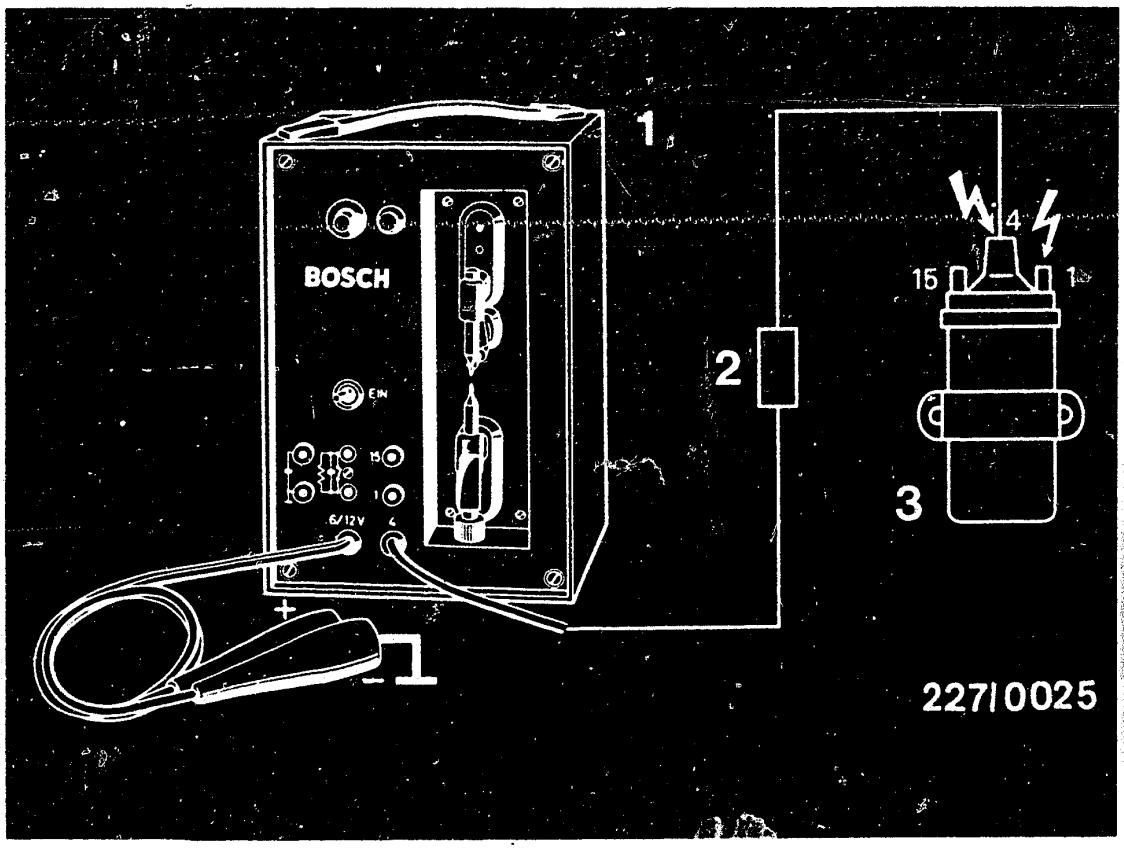
The dangerous locations are marked with danger arrows taking the example of the terminal diagram of an electronic ignition system.

6. Important vehicle information

- During the compression test, either pull off the trigger-box plug or firmly connect terminal 4 of the ignition coil to ground using an extra cable (dangerous voltages, insulation damage at ignition coil, ignition distributor or ignition harness).

  Note: The extra cable must be suppressed with at least 2 kΩ, e.g. with the interference suppression sleeve (5 kΩ) 0 356 500 001.

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).



1 = Spark gap
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

= Dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 2 kΩ must be connected between the spark gap and ignition coil terminal 4, e.g. sleeve-type suppressor (5 kΩ) 0 356 500 001.

- In the case of ignition distributors with engine-speed limitation the ignition distributor side terminal 4 must have 1 kΩ interference suppression. Operation without interference suppression will lead to the destruction of the trigger box.

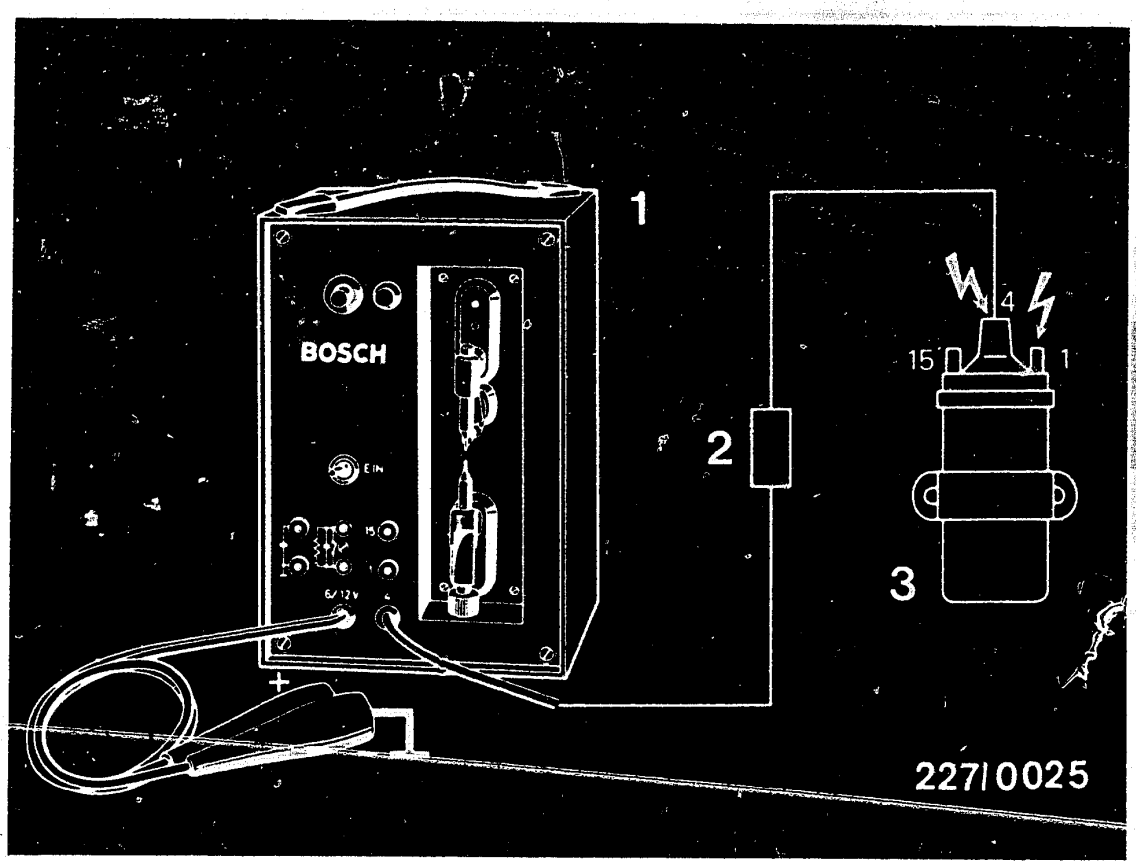
- Do not disconnect the battery while the engine is running.
- Incorrect battery polarity will lead to the destruction of the trigger box and ignition coil.
- Do not use a starting aid with more than 16 V or a fast charger for starting.
- The specified ignition coil (see Part No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- Ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.

7. Trouble-shooting

Note:
Trouble-shooting is limited to testing the components.

Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e.g. compression, valve clearance etc). Ambient temperature/ignition system temperature 0° to +100°C (temperature has considerable defect on measured value).



1 = Spark gap
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

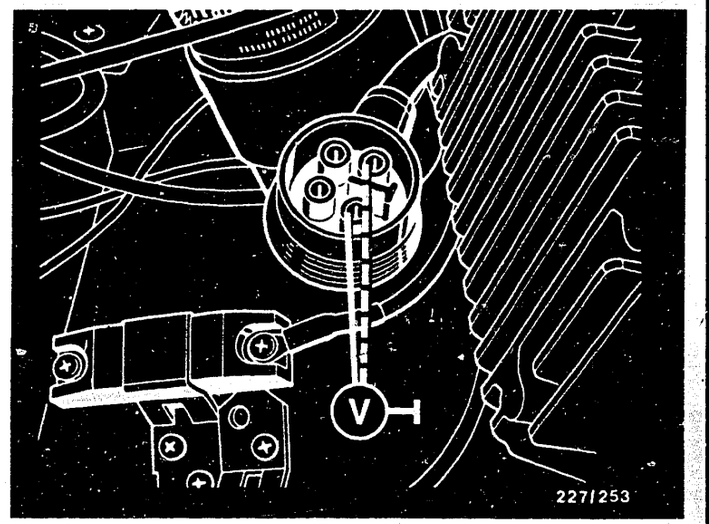
= Dangerous voltages (400 V - 25 kV)

7.1 Measuring the spark gap

Connect spark gap to ignition coil and set spark gap to 8 mm. Black clip (-) to vehicle ground. Do not connect red clip (+). Connect high-tension lead from tester to term. 4 (see picture). When the starting motor is operated, sparks must appear regularly at the spark gap. If this is not the case, check the following points.

7.2 Checking the cable connections

Remove the top part of air filter if necessary. Remove 4-pin connector from trigger box and test with voltmeter. With ignition on, between 11 and 13 V must be across connector term. 15 and term. 16. (See picture).



If there is no voltage, all connections as far as the trigger box must be checked for good contact (loose, corroded, open circuit).

7.3 Testing the ignition coil

(Connecting cables disconnected)

Primary resistance measured between term. 1 and 15;	0.30...0.60 Ω
Secondary resistance measured between term. 1 and 4.	7.3...14.5 kΩ

7.4 Testing the balast resistors

Balast resistor 0.4 Ω	0.30...0.50 Ω
Balast resistor 0.6 Ω	0.50...0.70 Ω

7.5 Testing the trigger box (tests 7.2, 7.3, 7.4 must have been performed beforehand)

To guarantee a proper measurement, there must be a battery voltage of 11...13 V.

7.5.1 Voltage values with breaker points open
(Testing blocking behaviour of transistors)

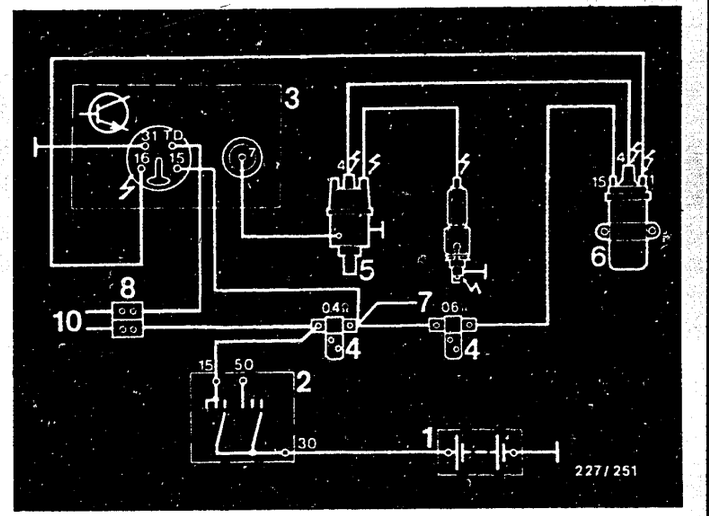
Connect voltmeter to terminal 15 of the ignition coil. Re-connect 4-pin connector on trigger box.
Switch on ignition. With the breaker points open, the voltage must be just as high as the battery voltage.

If this is not the case, the transistors are not blocking. Replace trigger box.

7.5.2 Voltage values with breaker points closed

Connect voltmeter to terminal 15 of the ignition coil.

Switch on ignition. With breaker points closed the voltage must be at least 2.7 V.
If this is not the case, replace the trigger box.



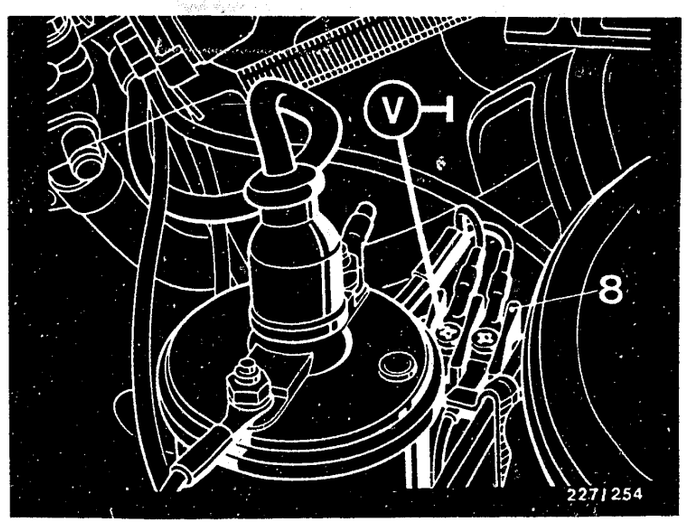
1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Balast resistors
5 = Ignition distributor
6 = Ignition coil
7 = To starting motor term. 15a
8 = Cable connector
10= To diagnostic socket

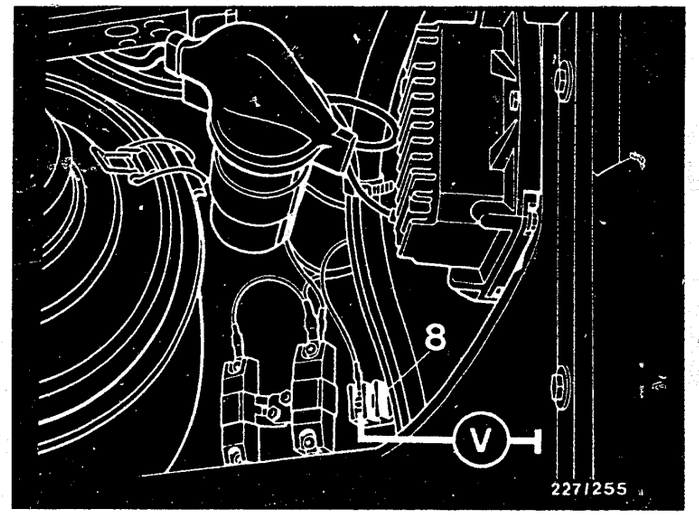
⚡ = Dangerous voltages (400 V - 25 kV)

7.5.3 Voltage drop across closed breaker points

Connect voltmeter to cable connector. See pictures. The voltage drop across the closed breaker points must be no more than 0.3 V.

If this value is exceeded, the breaker points must be cleaned or renewed.





8 = Cable connector

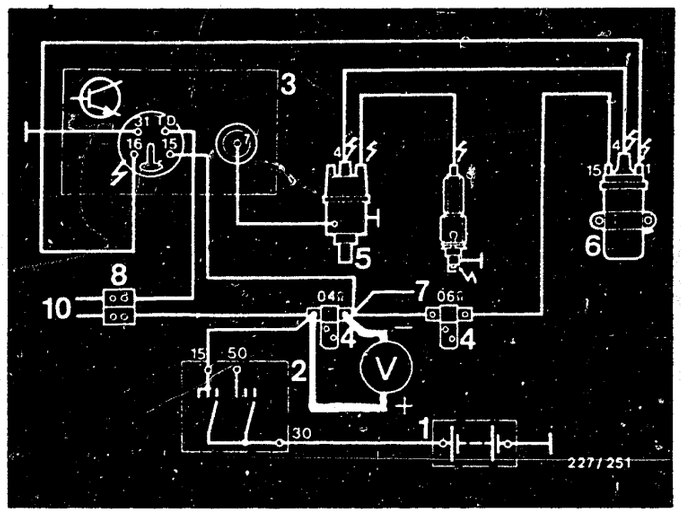
7.6 Measuring the voltage with bridged resistor (voltage increase for starting).

Connect the voltmeter to the 0.4 Ω balast resistor (see picture). Remove spark-plug connector.

Operate starting motor.

While starting, the voltmeter must drop to 0 V (plus max. 0.4 V voltage drop).
If this is not the case, there is open circuit in lead or in contact 15a in starting-motor relay.

Testing is completed.



1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Balast resistors
5 = Ignition distributor
6 = Ignition coil
7 = To starting motor term. 15a
8 = Cable connector
10= To diagnostic socket

⚡ = Dangerous voltages (400 V - 25 kV)

After-sales Service

Technical Bulletin

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition osciiloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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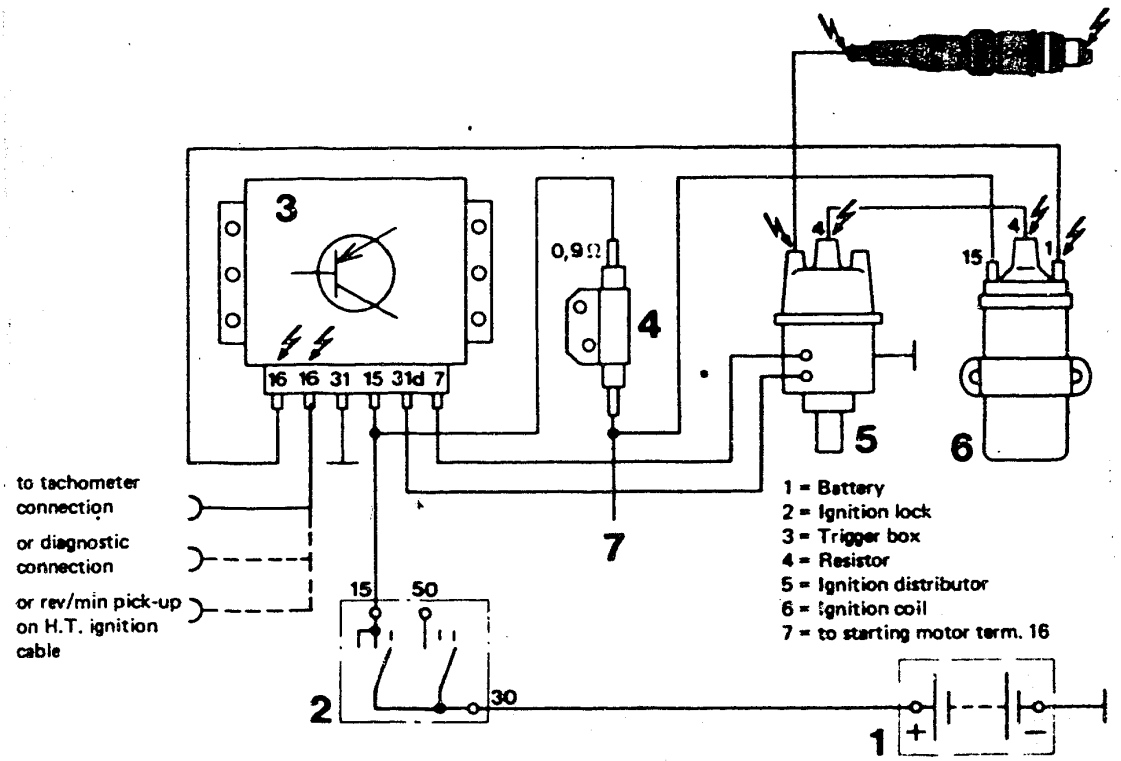
In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the content of this publication to our representative in your country.



Terminal diagram

After-sales Service

Technical Bulletin

EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

e.g. ignition systems, Jetronic, Motronic, ABS

VDT-I-227/107 En
1.1981

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
   Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

After-sales Service

Technical Bulletin

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En
1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	---------	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistor-ized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistor-ized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

After-sales Service

Motor Vehicle Service Information

TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

Table of Contents

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